

METHOD AND ARRANGEMENT FOR PORTION CUTTING OF FOOD ITEMS,  
AND USE OF A CUTTING DEVICE IN THE ARRANGEMENT

The invention relates to a method and an arrangement for the portion cutting of food  
5 items, especially meat products, in pieces of predetermined shapes, such as quadratic  
pieces of meat.

Within the foodstuffs industry, demands are made from time to time concerning  
special cuts of meat, an example of these being special portion cuts of poultry. The  
10 starting point for the meat cuts is e.g. de-boned leg and breast meat, where the  
remaining meat and skin are made "smooth" in one piece. Today, the cutting is  
carried out manually by persons who often have years of training, and the cut  
portions consists mainly of substantially quadratic pieces with a relatively precise  
size/weight.

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Raw thigh and breast meat of chicken passes through the following processes:

1. Manual removal of bone and "smoothing-out" of the initial piece.
2. Manual fine-trimming of the initial piece, so that it is substantially whole and  
without loose skin, fat or meat shreds.
- 20 3. Manual portion cutting into quadratic pieces with a weight of around 20-25g  
is carried out "by eye" following experience, and by removing parts of the  
meat which are not "regular".

This special portion cutting has hitherto only been performed manually, and it has  
25 shown that this gives rise to considerable disadvantages, especially in the third part  
of the process. In the first place, an experienced worker can produce only relatively  
few pieces of meat with acceptable size/weight within a given period of time, and  
secondly the meat wastage for an experienced cutter lies at around 17-20%, and  
considerably higher for an inexperienced cutter.

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- The international patent application WO94/26479 describes an apparatus for portion cutting of relatively regular food items, such as bone-free meat products, boiled ham, sausages etc. into uniform cubes, where the apparatus comprises two successively arranged cutting units. The first unit cuts in slices, and via a rotating knife the second
- 5      unit cuts the slices into strips, which immediately afterwards are cut by a number of parallel knives into smaller, uniform cubes. The cubes are generally used as components in ready-prepared dishes, including toppings for pizza, and are therefore of relatively small size.
- 10     This known apparatus, and other known apparatuses of the same type which comprise a number of stationary parallel knives, are limited in their use, the reason being that they are not suitable for the cutting-up of food items in larger, more complex portions, since there is no possibility for adjustment of the cutting-up individually to the contour of the initial item, i.e. a varying breadth and thickness of
- 15     the initial pieces and/or irregular surfaces on the food item.

- Thus with the manual cutting the problem exists in the low speed with which the pieces are cut-up, even by a trained worker, in the relatively long time which is used in the training of a worker, and in the high degree of meat wastage, i.e. seen as a
- 20     whole, the low output achieved with manual cutting.

- It is in light of this that the object of the present invention is to make it possible for a cutting-up into special portions to be carried out in a substantially quicker and more accurate manner than the present manual cutting, whereby said portion cutting also
- 25     results in less meat wastage.

Furthermore, it is an object of the invention to enable other more complex, larger portion cutting of a food item.

This object is achieved by a method and an arrangement for portion cutting of food items, especially meat products, in pieces of predetermined weight and dimensions, such as quadratic pieces of meat, where the cutting is effected in two cutting stages, where the first stage prepares the item by cutting the item into parts, which in the

- 5 second cutting stage are cut into pieces of predetermined weight and dimension.

The method preferably comprises the following stages:

- transport of the items in a first feeding direction in a first cutting arrangement, in which arrangement the items are cut-up into strips in a cutting unit,
- transfer of the strips from the first cutting arrangement to one or more further cutting arrangements with second/other feeding direction/feeding directions different from the first feeding direction, and
- cutting-up in the one or more further cutting arrangements, in which further cutting arrangement/arrangements the strips are cut in a cutting unit into pieces of predetermined weight and dimensions, such as rectangular meat pieces.

There is hereby provided a method which makes it possible to perform a cutting-up into said mentioned portions, and this is effected in both a quick and profitable manner by an automation of the hitherto manual process. With the invention, there can be achieved an improvement in efficiency from the present few pieces per hour with the manual cutting to more than 1000 per minute by use of the three additional cutting units

- 25 In a preferred example embodiment, in the first cutting device there is carried out a first measuring of the shape, structure and/or dimension of the food item. It is hereby made possible that a scanning of the shape/structure of the food item can form the basis for a planning of the cutting profile, and that the cutting can be carried out in accordance with this profile and direct the strips to the additional cutting device or devices. Moreover, preferably in the one or more additional cutting devices, there is

performed a further measurement of the shape, structure and/or dimension of the strip. It is herewith possible to verify or correct the first measurement from the first cutting device for a possible alteration of the cutting profile for the additional cutting device(s).

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- In a preferred embodiment, in connection with the first measurement and on the basis of predetermined dimensions and/or weight of the pieces, a cutting profile is determined where at least a part of this cutting profile is carried out by the first cutting device. The dimensions and/or the weight of the strips and the cutting-up of
- 10 these can herewith be precisely determined, and the cutting profile of this can be planned on the basis of the shape/appearance of the food item. The food item is preferably pre-cut to an approximately rectangular shape, which makes it relatively simple to determine a cutting profile for the item. The first cutting device can herewith be provided with a control programme which plans the whole of the cutting
- 15 sequence, i.e. also the cutting-up in the remaining cutting units.

- In an example embodiment, at least a part of said cutting profile is communicated further to the additional cutting device(s). By a simple appropriate programming of just one of the cutting devices, the whole of the cutting profile for the food items can
- 20 herewith be communicated further for execution by the additional cutting devices.

- In an example embodiment, two or more of the other feeding directions lie substantially parallel with one another, and in another embodiment one or more of the feeding directions lie substantially at right-angles to the first feeding direction.
- 25 Rectangular, quadratic pieces can hereby be produced in a simple manner solely by a simple transfer of the strips between the first and the additional cutting device(s).

- The method preferably comprises manual positioning of the food items in the first cutting device, and/or manual transfer of the strips to one or more of the additional
- 30 cutting devices. By the placing of items or transfer of strips either "by eye" or on the

basis of a planned portion-cutting-profile, each operator can place each item/strip in/for the cutting device.

- In another example embodiment, the method further comprises non-manual placing
- 5 of the food items in the first cutting device and/or non-manual transfer of the strips to one or more of the additional cutting devices. Automatically and without the need for manual positioning, there can hereby be achieved an appropriate placing for cutting into pieces with predetermined dimensions and weight.
- 10 In a second aspect of the invention, there is provided an arrangement for portion-cutting of food items, especially meat products, in pieces of predetermined weight and dimensions, such as quadratic pieces of meat, comprising a first cutting device which comprises a cutting unit for the cutting of the food items into strips during the transport in a first feeding direction, one or more additional cutting devices, each
- 15 comprising a cutting unit for the cutting of the strips into pieces of predetermined weight and dimensions, such as quadratic pieces of meat, during transport in other feeding directions different from the first feeding direction and after transfer. The arrangement can herewith expediently carry out a precise and profitable portion-cutting, such as e.g. the special cutting of pieces of predetermined
- 20 dimensions/weight. Moreover, the arrangement can make it possible that known cutting devices can be used in the setting-up of the arrangement, which makes the overall arrangement relatively cheap in development costs.

A second aspect of the invention comprises the use of a cutting device in an

25 arrangement according to the invention, and with one use the said cutting device is arranged to send at least a part of the cutting profile further to other cutting devices. The two or more cutting devices, which are in an arrangement according to the invention, can herewith mutually communicate between or from the processor means.

In the following, the invention is described in more detail with reference to the enclosed drawing, where

Fig. 1 shows an arrangement in one embodiment of the invention.

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From Danish utility model no. DK 96 00164 U3, a cutting apparatus is known for portion cutting of food items. Herein there is described a machine for portion cutting of food items which comprises a cutting unit for the cutting of the items, which by a first and second conveyor respectively are fed past the cutting unit. A scanning system for detecting the shape of the items is arranged at the first conveyor. The shape of the items is registered in computer means which, on the basis of the shape of the items and control of the transport speed of the first conveyor, can control the machine for the portion cutting of the items with a predetermined weight, length or size.

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As will appear from fig. 1, in one embodiment of the invention an arrangement 1 for portion cutting of food items 2 into quadratic portions 4, especially meat products, comprises four cutting devices 10, 20, 30, 40, where a first cutting device 10 cuts the food items 2 into strips 3 and has three further cutting devices 20, 30, 40 placed downstream of said first cutting device for the cutting of the strips 3 into quadratic meat pieces 4, which can be sent further (not shown) for additional pre-processing, such as further cutting, packing and/or storage. These cutting devices can be of the type described in DK 96 00164 U3, but can naturally also be of another type, possibly with other forms of cutting units or scanning means, and the computer means can be individual for each individual cutting device or can be common to them all, possibly in communication with one another.

The expression strips 3 is to be understood to comprise a cut-up food item which, independent of the thickness of the item, is a strip of varying width.

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- As shown in fig. 1, the first cutting device 10 has a first feeding direction indicated by an arrow 10R, and the three further cutting devices 20, 30, 40 have other feeding directions indicated respectively by the arrows 20R, 30R and 40R, where the other feeding directions lie parallel with one another and at right-angles to the feeding direction 10R, i.e. that they lie with feeding directions which are different from the first feeding direction 10R. It is obvious that if one can envisage that the other feeding directions 20R, 30R and 40R lie turned 180 degrees in relation to the first feeding direction 10R, they will also lie with feeding directions which differ from the first feeding directions 10R.
- 10 The transfer of strips 3 between the first cutting device 10 and one or more of the subsequent cutting devices 20, 30, 40, which extend in a substantially parallel manner, can for example with said special portion cutting expediently be carried out manually in accordance with a planned portion-cutting profile on the basis of the
- 15 measurement from the scanning means and /or be carried out "by eye". Alternatively, transfer means such as conveyors with deflector means can be placed where the transfer and therewith the placing of the strip in the one or more of the further cutting devices is possibly controlled by the portion-cutting arrangement's computer means.
- 20 The placing of the food item 2 at the feed-in to the first cutting device 10 is of importance for the scanning and the planning of the portion-cutting profile, which is carried out by the processing means on the basis of predetermined requirements and dimensions and/or weight of the meat pieces 4 submitted to the computer. A manual placing based on the shape of the item can further increase the accuracy of the
- 25 arrangement and reduce the percentage of wastage, for the reason that the output item can as mentioned be uniform in shape, thickness and width. A placing of the items based on scanning and transfer of each of the items/strips 2,3 is naturally also an obvious possibility.

The four cutting devices 10, 20, 30, 40 are placed in relation to one another in such a manner that the first cutting device 10 can receive the food items 2 to be cut, for the scanning and cutting of these into strips, which individually or several together are transferred to each of the three further cutting devices 20, 30, 40.

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With the invention it is realised that two or more of the further cutting devices can be cutting devices 30 with two or more tracks, as shown in the figure.

10 The said special portion-cut items have dimensions with a length of less than twice the width and height, approx. 25x25 mm and a weight of around 18-32 g, but others can naturally be defined by the arrangement according to the invention.

15 In an arrangement according to a preferred embodiment of the invention, with a set-up which resembles that shown in fig. 1, but without the cutting device 40, 130 items per minute can be cut on the cutting device 10, and thereafter the strips shall be distributed in three lines with 1-track cutting device 20 and a 2-track cutting device 30. When the 130 original items have such a size that they can each be cut into three strips 4, they become 390 strips in all. If the strips are distributed on the three tracks in a uniform manner, they become 130 strips per track per minute. When these strips 20 can each be cut into three quadratic pieces, they become 1170 diced items per minute for three lines. If these diced items each weigh 22g, the collective result is 25.74 kg per minute, which corresponds to 1544 kg per hour. On this basis it is calculated collectively that said arrangement can save 8 operators.

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